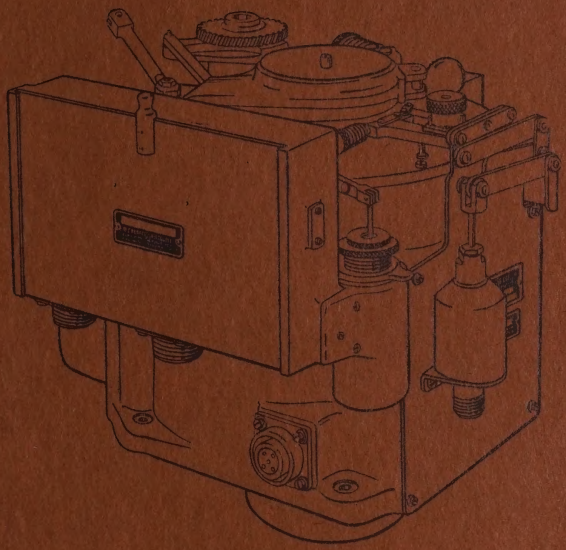
Electronic
C-1 AUTOPILOT
DIRECTIONAL STABILIZER
WITH DIRECTIONAL PANEL AND DIRECTIONAL ARM LOCK

RESTRICTED



Transvision

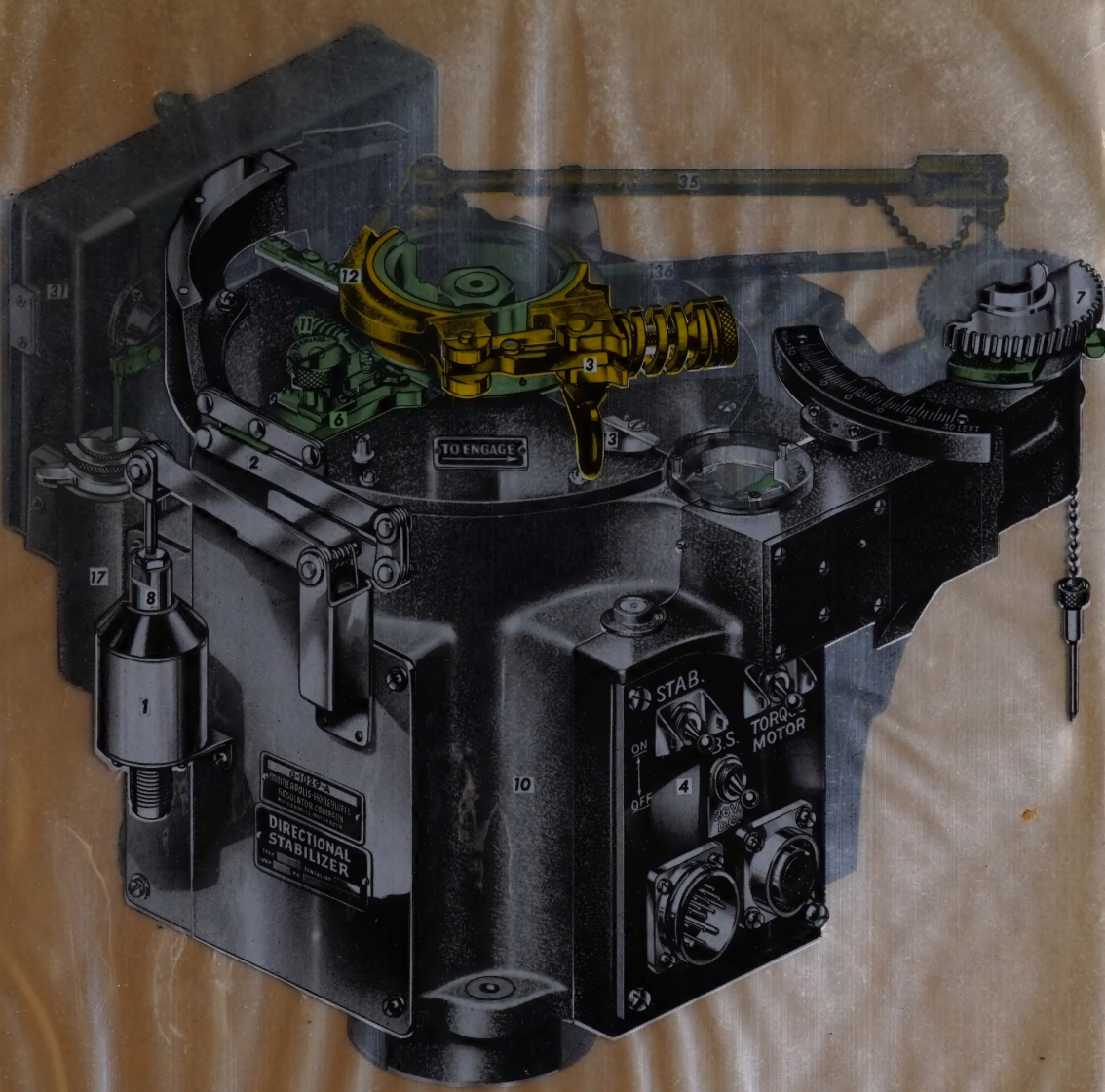
TECHNICAL PRESENTATION BY JORDANOFF

MINNEAPOLIS-HONEYWELL REGULATOR COMPANY
AERONAUTICAL DIVISION
MINNEAPOLIS, MINNESOTA

DIRECTIONAL STABILIZER

Guiding each giant bomber on its mission, keeping it on its charted course across the trackless sea, steering it through fog or night, then holding it in straight and accurate flight across the target while bombs are dropped—that's the vital function of the Directional Stabilizer.

A rapidly spinning gyroscope in the Stabilizer tilts in its mounting in response to the slightest directional deviation of the airplane. This tilting action closes a circuit which starts electrical equipment to work, producing corrective Autopilot flight control.

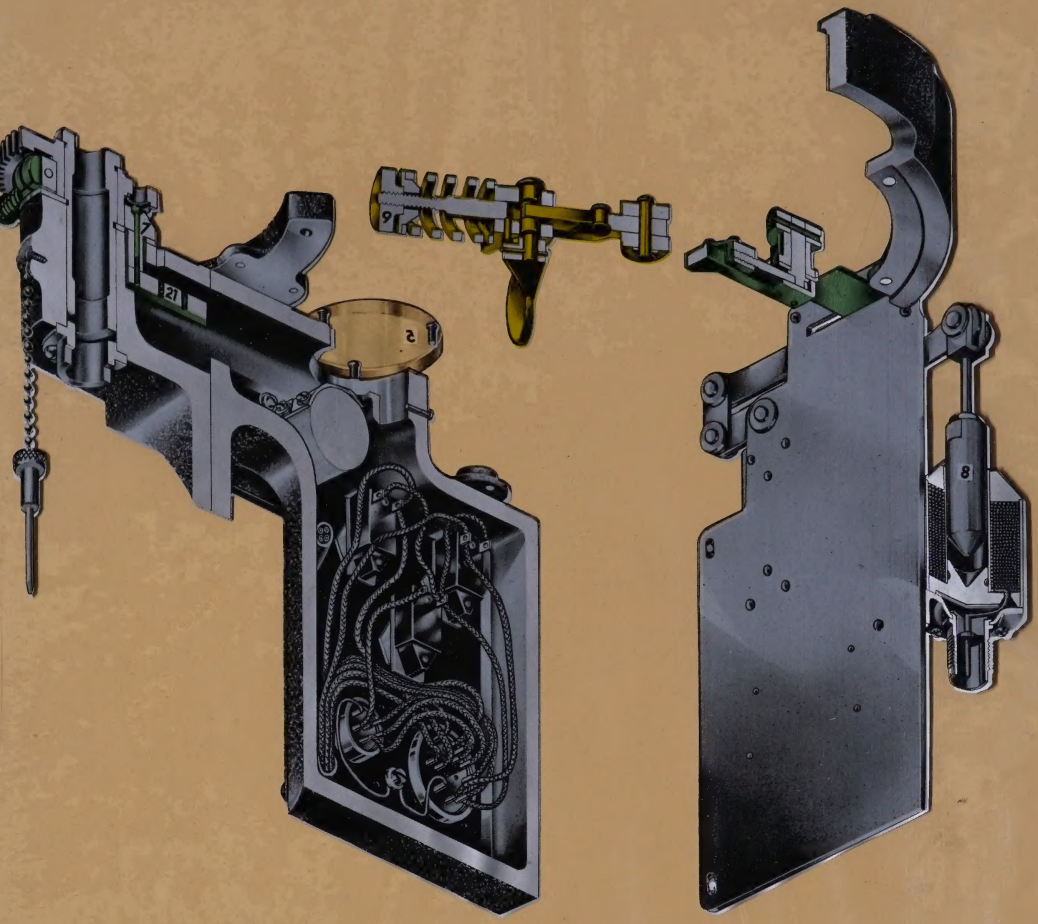


When the pilot makes a turn with his Autopilot Turn Control, the Directional Arm Locking Solenoid (1) is energized, and its Plunger (8) is pulled down to close the Clamping Jaws (2) firmly on the extension of the Autopilot Clutch Arm (6). This locks the Autopilot Clutch rigidly to the Stabilizer housing and prevents the directional gyro in the Stabilizer from canceling the desired turn.

The Bombsight Clutch (12) is engaged or disengaged by the Bombsight Clutch Engaging Lever (3).

The Switch Panel (4) provides switches for energizing the various electrical units in the Stabilizer when the Autopilot is not in use.

PDI Window (5) enables bombardier to see the PDI pot wiper.



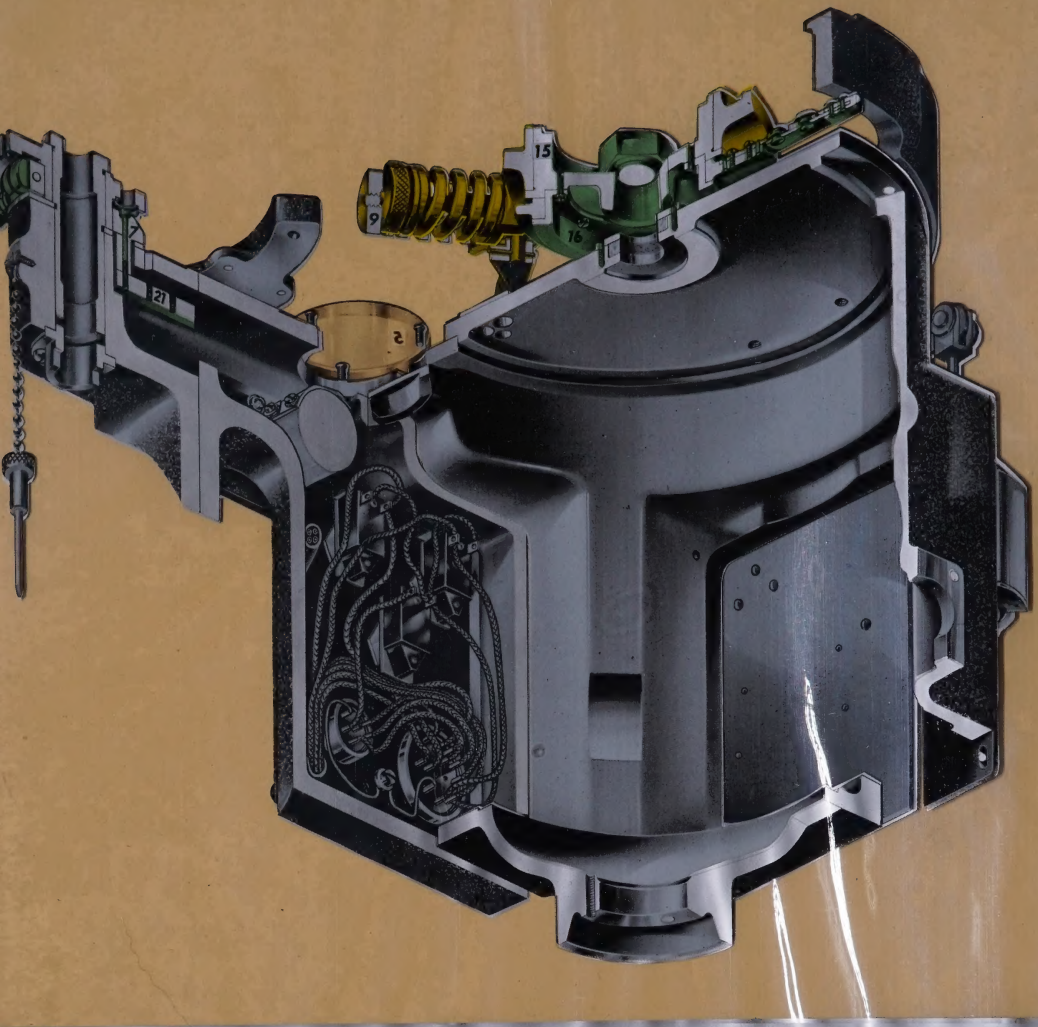
Drift Gear Clutch (7) and its attached PDI Wiper Arm are positioned by the Autopilot Connecting Arm (36) on page 11.

Knurled Knob (9) adjusts tension of the Bombsight Clutch (12).

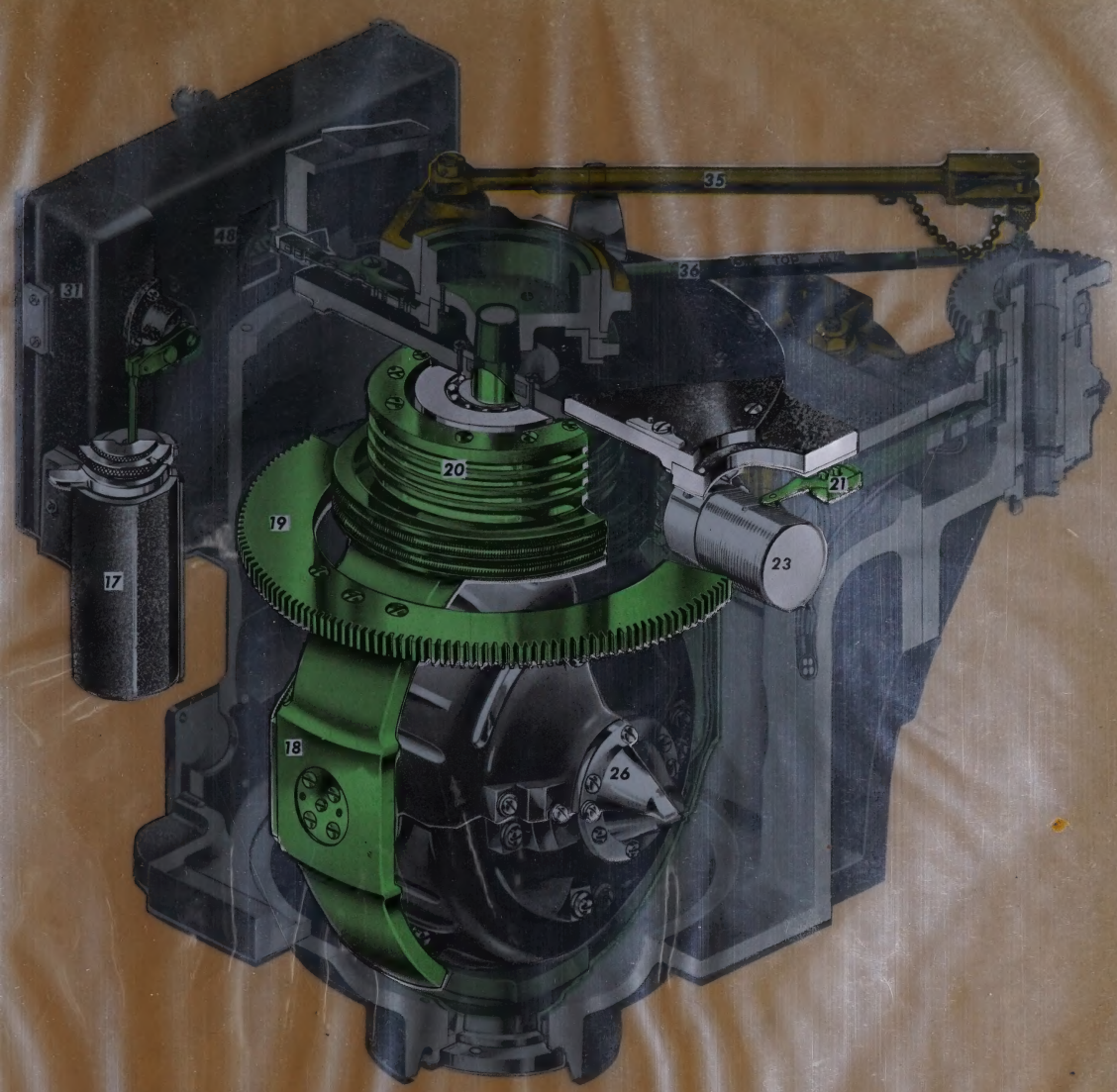
Knob (27) is used to engage or disengage the Autopilot Clutch (12). Knob (11) is used to adjust the Autopilot Clutch tension.

Stabilizer Housing (10), finished in black crackle enamel, serves as a framework for the various parts. Vent cover (13) enables bombardier to uncover ventilating holes in the Stabilizer housing to cool the interior when necessary.

PDI Scale (14), calibrated in degrees of directional airplane deviation, provides the bombardier with a reference against which to read deflections of the PDI Wiper Arm.



Bombsight Clutch Drum (15) and Autopilot Clutch Drum (16) are fastened securely to the upper cardan gudgeon pin and are therefore held in a fixed position by the directional gyro.

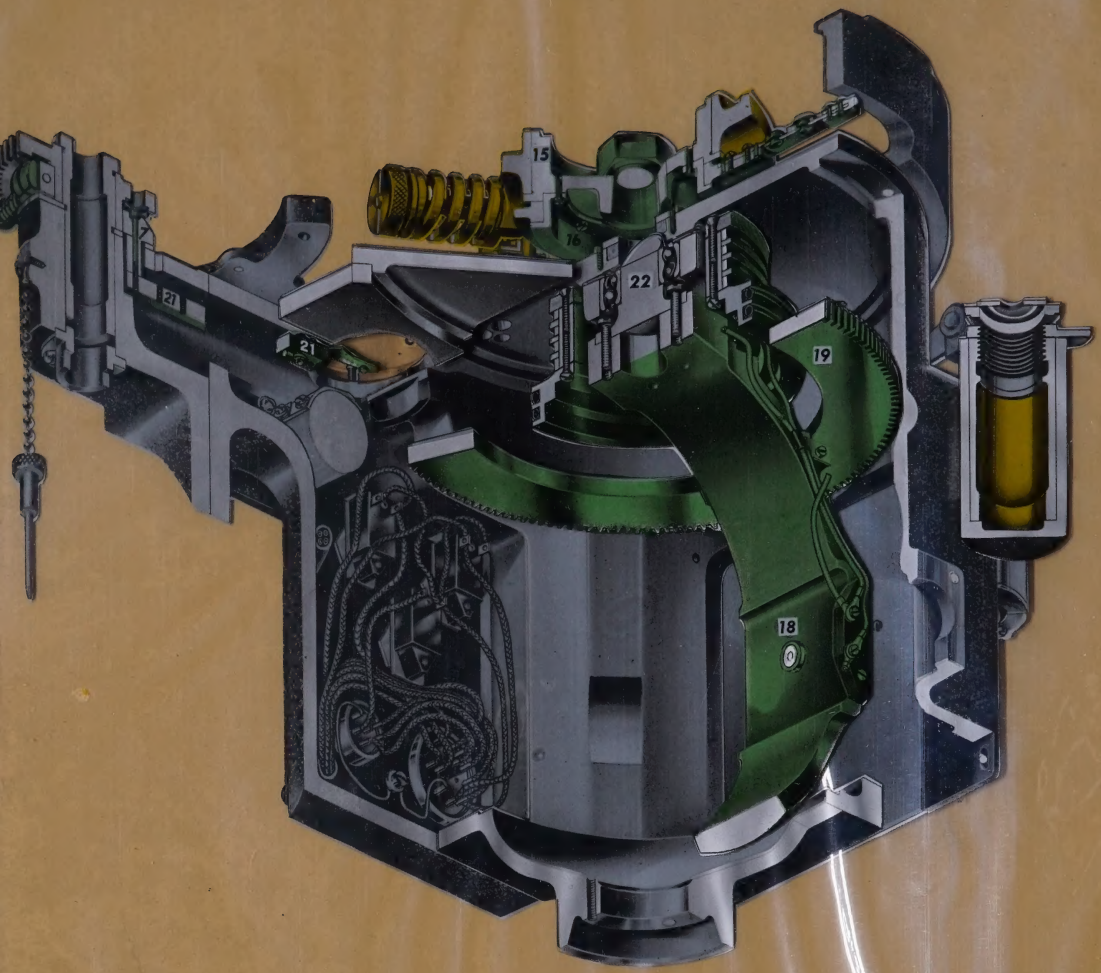


Dashpot (17) on the Directional Panel controls the movement of the rudder pot wiper to momentarily apply an extra rudder signal proportional to the speed of the airplane's turn axis deviation.

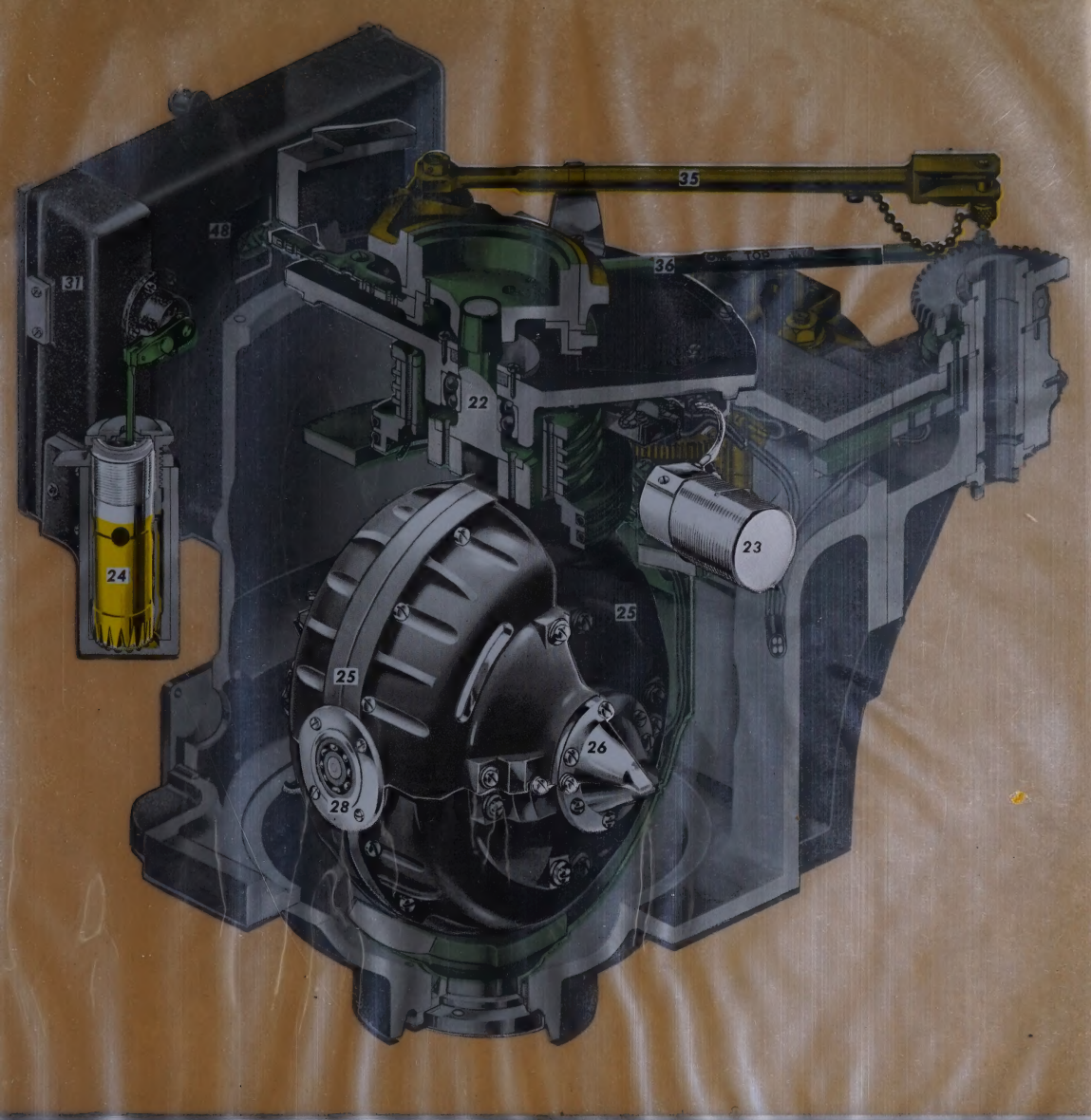
Cardan Gear (19) is bolted rigidly to the Cardan Ring (18) which supports the Rotor Case on a horizontal axis. The Cardan itself pivots on a vertical axis.

Four Slip Rings (20) provide paths for electric current to the Directional Gyro and Clutch Contact Sector.

PDI Pot Wiper (21) picks up a voltage from PDI Pot (23) to operate the PDI instrument on the pilot's instrument panel.

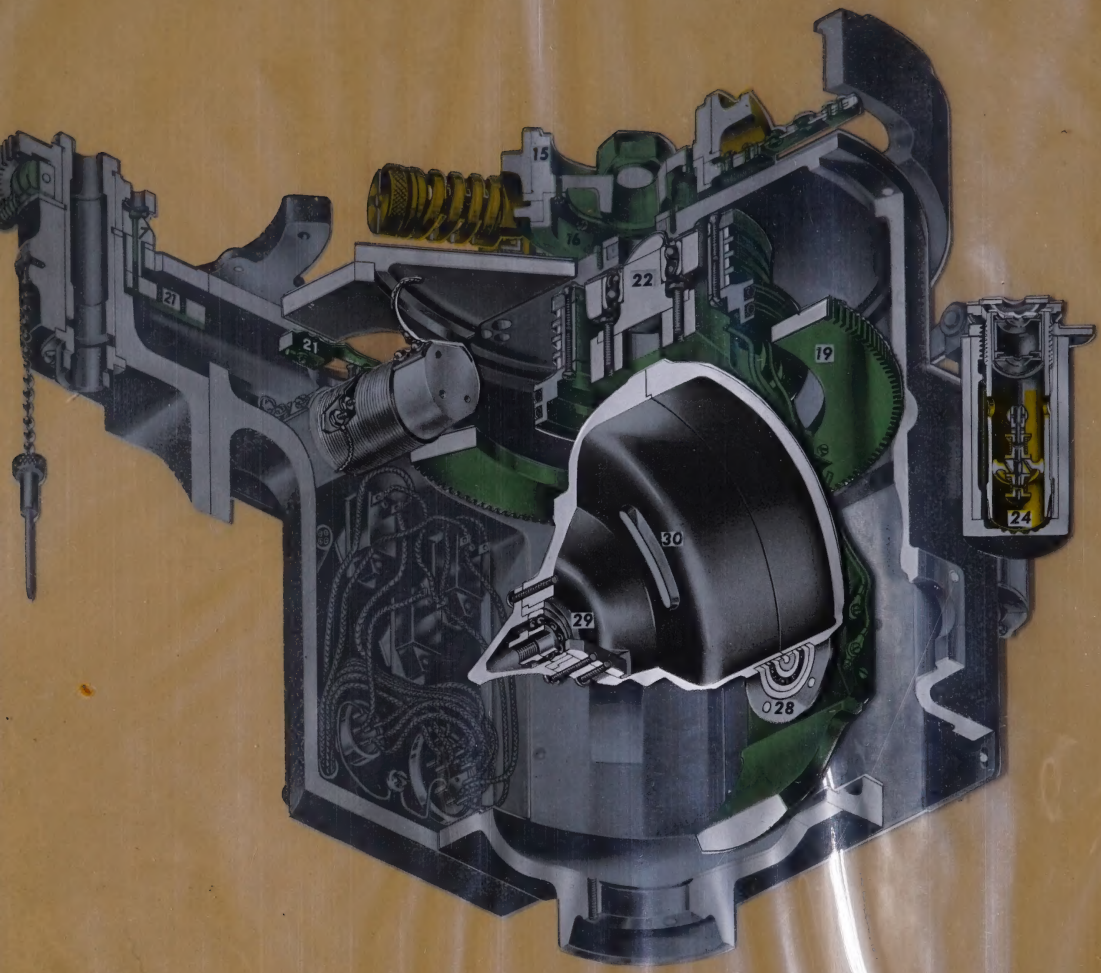


Upper Cardan Gudgeon Pin (22) forms the top pivot for the Cardan Ring (18). It also serves as an arbor on which the bombsight and Autopilot clutch drums are mounted.



Rotor Case (25) is supported between horizontal Gudgeon Bearings (28).

Bearing Caps (26) at each end of the Rotor Case cover the Rotor Bearings.



Fixed Rotor Bearing (29) at this end of the Rotor Case is clamped securely in place to prevent any endwise movement of the Rotor Shaft.

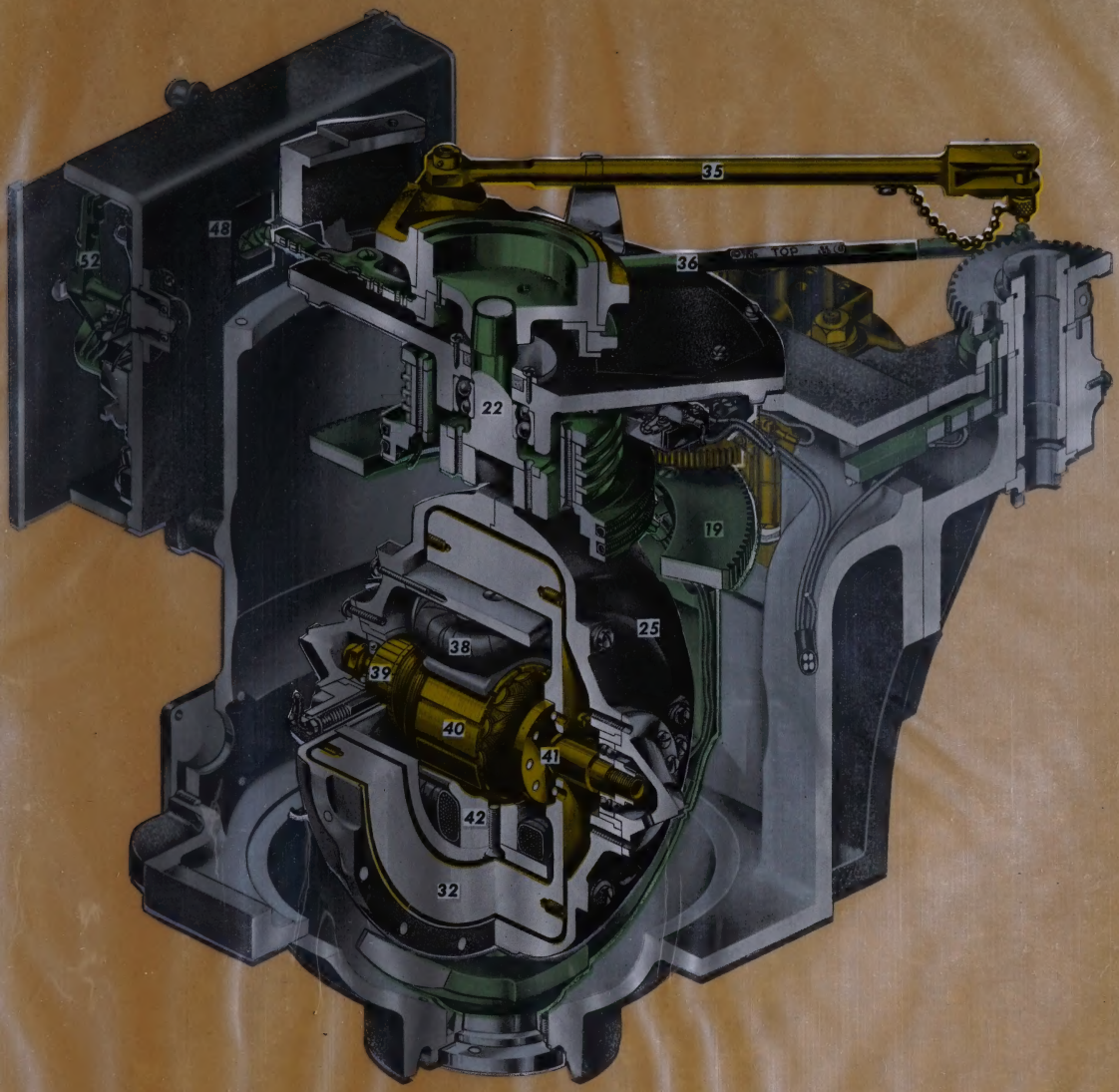
Ventilating Slot (30) permits free circulation of air around the spinning Rotor (32).

Dashpot Cylinder (24) is adjustable up or down to regulate the effectiveness of the Dashpot.

The Directional Panel (31) houses the Rudder Pot and the Banking Pot which apply electrical signals for Autopilot flight control in response to any directional deviation of the airplane.

The Gyro Rotor (32), spinning at 7700 rpm, provides the gyroscopic forces employed by the Stabilizer in maintaining the directional rigidity of the cardan.

This illustration is an inside view of a section of the Rotor (32), Field Housing (33) and the free Rotor Bearing (34) at the brush end of the Rotor Case. Note that the stationary Field Housing (33), fastened to the Rotor Case, fits inside the hollow Rotor.



This illustration shows the construction of the Gyro Rotor and Rotor Case. The hollow Rotor (32) is fastened by the Rotor Mounting Flange (41) to the same shaft as the Armature (40) and the Commutator (39). Field Coil (38) energizes the upper Field Pole which, like the lower Field Pole (42), is mounted in the Field Housing between the Armature and the Rotor.

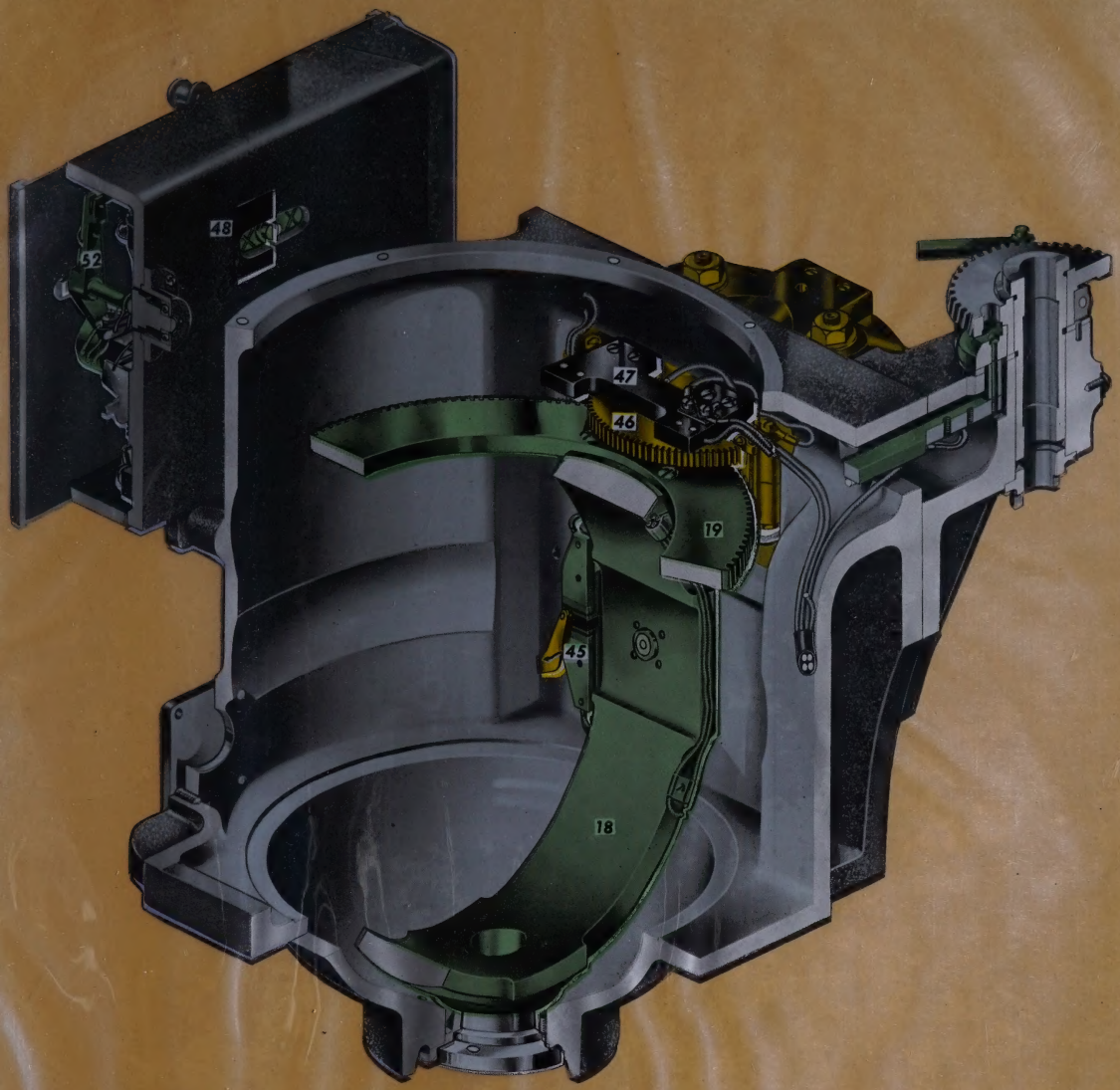
The upper Cardan Gudgeon Pin (22) is fastened to the top of the Cardan Ring and supports the Autopilot and Bombsight Clutch Drums as shown on page 6. When engaged the Bombsight Clutch and the Autopilot Clutch hold the Bombsight Connecting Arm (35) and the Autopilot Connecting Arm (36) in fixed relation to the Rotor.

Brush Mounting Blocks (37) support the contact brushes which work in conjunction with the slip rings to supply current to the Gyro.

Gudgeon Bearing (43), like a similar bearing shown on page 7, supports the Rotor Case (25) on a horizontal axis.

Brush Tube (44) contains one of the two brushes required for operation of the Gyro Motor.

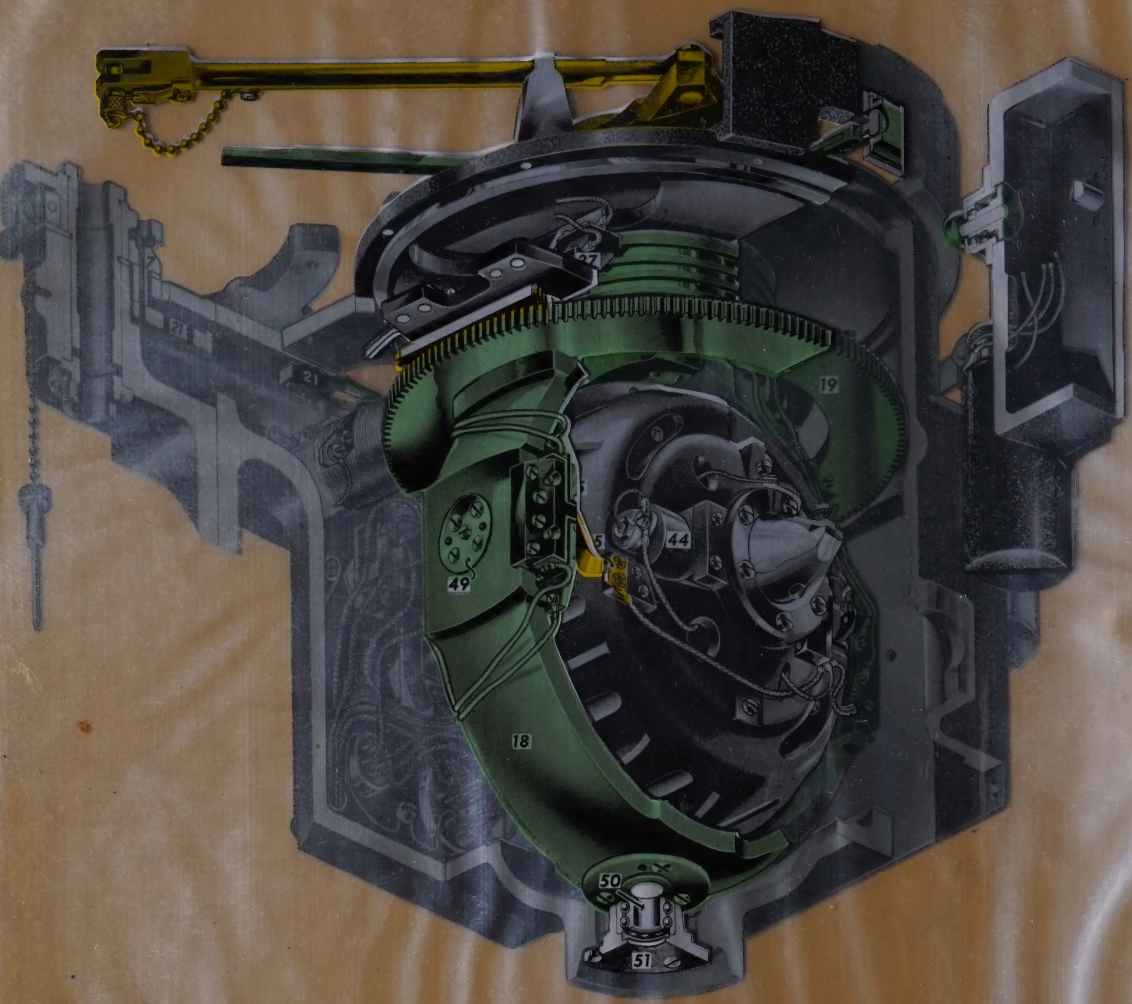
Part of the Clutch Contact Wiper Blade (45) is shown here mounted on the Rotor Case. The rest of the blade is shown on the opposite page.



Clutch Contact Wiper Blade (45) fastened to the Rotor Case moves up or down on the Clutch Contact Sector Block fastened to the Cardan (18) as the Rotor tilts in response to forces tending to turn it.

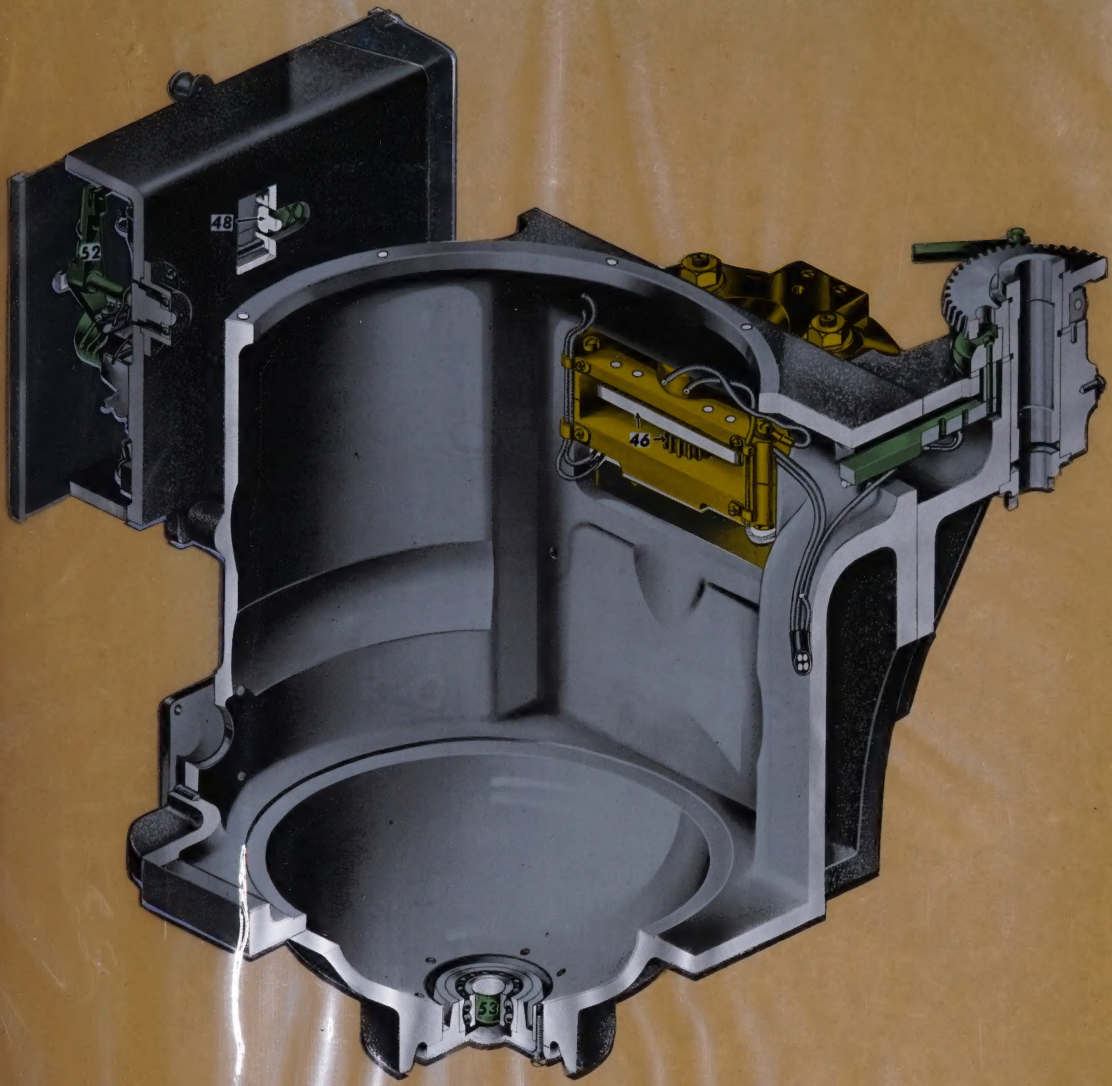
Cardan Gear (19) is fastened to the Cardan (18) and is driven in one direction or the other by a Pinion fastened to the underside of Gear (46) which is a part of the Torque Motor assembly described on following pages.

Mounting Bracket (47) supports the two Brush Mounting Blocks (37) shown on the opposite page.



Rotor Case Gudgeon Pin (49) fastened to the Cardan fits into the Gudgeon Bearing shown on page 12.

Cardan Gudgeon Bearing (50) is held in place at the bottom of the Stabilizer Housing by the Cardan Gudgeon Bearing Socket (51).

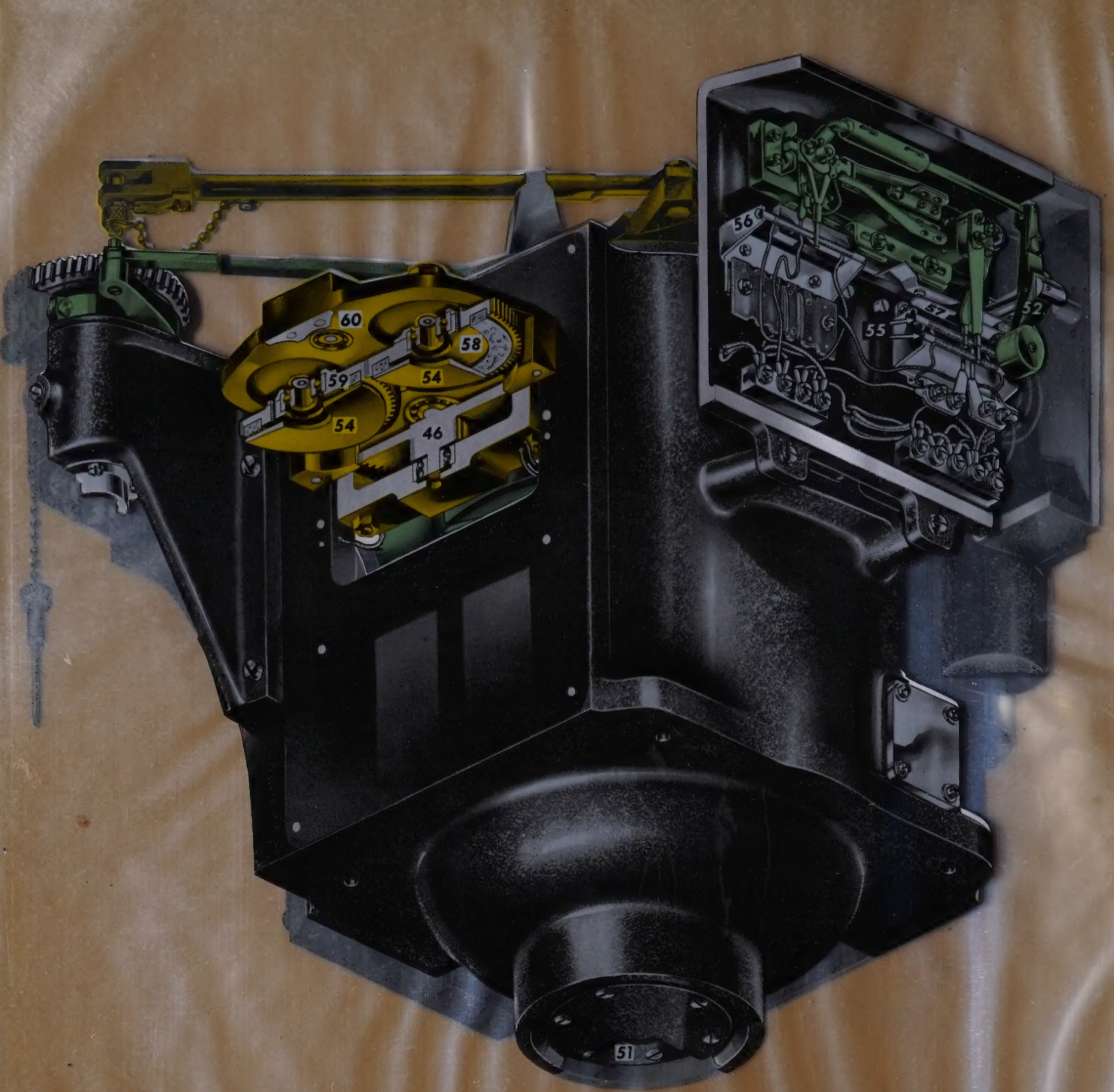


This illustration shows the Cardan Drive Gear (46) and its pinion which drives the Cardan Gear.

Cardan Gudgeon Pin (53) fastened to the bottom of the Cardan fits the inner race of the Cardan Gudgeon Bearing.

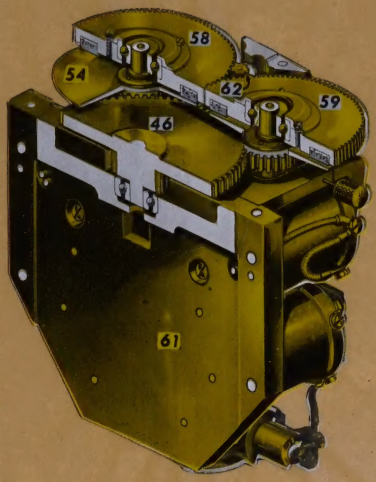
The tip of the Directional Panel Drive Arm (48) fits into a recess in the back of a slide within the Directional Panel.

Crank Arm (52) is part of the linkage between the Dashpot and the Rudder Pot Wiper in the Directional Panel.



Part of the Torque Motor Assembly is shown at the left in this illustration. Torque Motor Clutch Gear Plate (60) is fastened to the Torque Motor Base (61) shown on the opposite page. Torque Motor Clutch Gears (58 and 59) rotating in opposite directions have cork inserts on their bottom sides which engage with the Clutch Discs (54).

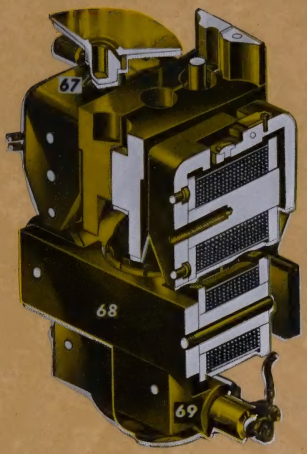
Rudder Pot (56) and the Dual Banking Pots (55) are the sources of signals which are picked up by their respective wipers and transmitted to the rudder and aileron sections of the Autopilot Amplifier to produce rudder and aileron action. Erecting Cutout Switch (57) closes to operate the Erecting Cutout mechanism in the Vertical Flight Gyro when the airplane turns.



The illustration at the right shows how Clutch Gear (59) is driven by Clutch Gear (58) which, in turn, is driven by Intermediate Pinion (62). It also shows how the Cardan Drive Gear (46) is driven by the Pinion of whichever Clutch Disc is engaged with its adjacent Clutch Gear.

Field Magnet (64) is one of the two field magnets fastened to the Torque Motor Base (61) which are required for the operation of the Torque Motor.

Clutch Magnet (63), energized by the lower segments of the Clutch Contact Sector on page 13, operates the Clapper (65) and raises the Clutch Disc (54) against its Clutch Gear when the brush end of the Rotor Case tilts downward. A similar mechanism on the opposite side of the Torque Motor (page 20) operates the other clutch when the rotor tilts upward. Cardan Drive Gear (46) is driven by whichever clutch is engaged.

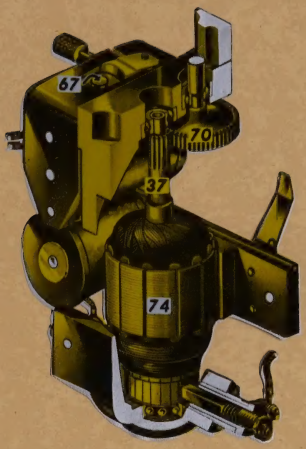


Sliding Cover (66) closes the front of the Directional Panel.

Field Pole (68) connects the two Motor Field Magnets.

Motor Brush Tube (69) contains one of the two Torque Motor Brushes. The other Brush Tube (77) is shown on page 22.

This illustration shows how the gear train and Clappers are supported by the Torque Motor Base (61). It also shows how the inner surface of Field Pole (68) and the lower Armature Bearing (71).

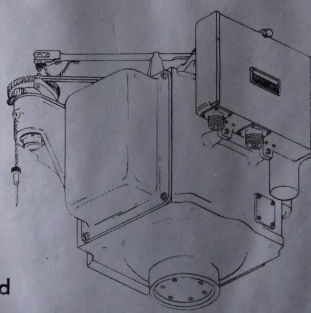


The Torque Motor Armature (74) rotates continuously at more than 4,000 rpm and its Pinion (37) drives the Intermediate Gear (70) which is attached to the Intermediate Pinion (62) on page 17.

Each Clapper is fitted with a Bronze Insert (67) which bears against the Clutch Disc when the Clapper is tilted to engage the clutch.

The function of Clutch Magnet (75) is similar to that of Clutch Magnet (63) on page 18.

Clapper Stop (76) holds the Clapper at a proper distance from the magnet so it will operate rapidly and positively when the magnet is energized.



Rear view, showing Torque Motor covered

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